Operating Instructions
CPS 300

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DocuNo: 040.001.02

Date: February 2001

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1. CPS 300 overall view

- Advanced CNC positioning control used for single-axis or multiaxis applications.
- Easy and menue-guided operation and programming. Knowledge of a programming language is not requested.
- Easy and comfortable input due to decoded text display and well arranged keyboard. No multiple key assignment.
- Compact unit comprising controllers as well as position control and operating element.
- Password protected parameter input as decoded text ensures easy adaptation to drives and machines.
- Sinusoidal acceleration curves considerably reduce the load of the mechanical components.
- Use of highly dynamic drives due to short control cycle times.
- Automatic diagnosis with decoded text display.

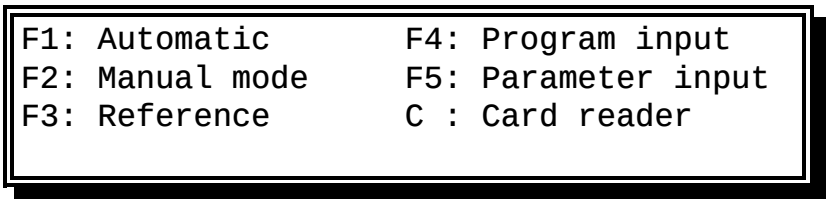
2. Operating modes

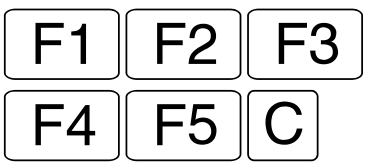
- Different operating modes are available to ensure all necessary functions.
- Menue-guided calling by means of the controller.
- If necessary, all operating modes can be disabled.

Operating mode	Function
Automatic - single step - cycle run - continuous run	Execution of program sequences step by step operation complete program run contiguous program repetition
Manual mode	Move axles in manual mode rapid motion, creep speed approach starting position set zero point reference run teach-in
Reference run	Automatic search for the machine reference point. Variant setting and programming by parameters.
Program input	Menue- And mask-guided program generation. Record-by-record input Program processing functions
Parameter input	Setting of machine-, controller- and user-specific auxiliary values
Card reader	Parameter and program storage

2.1 Main menue / operating mode selection

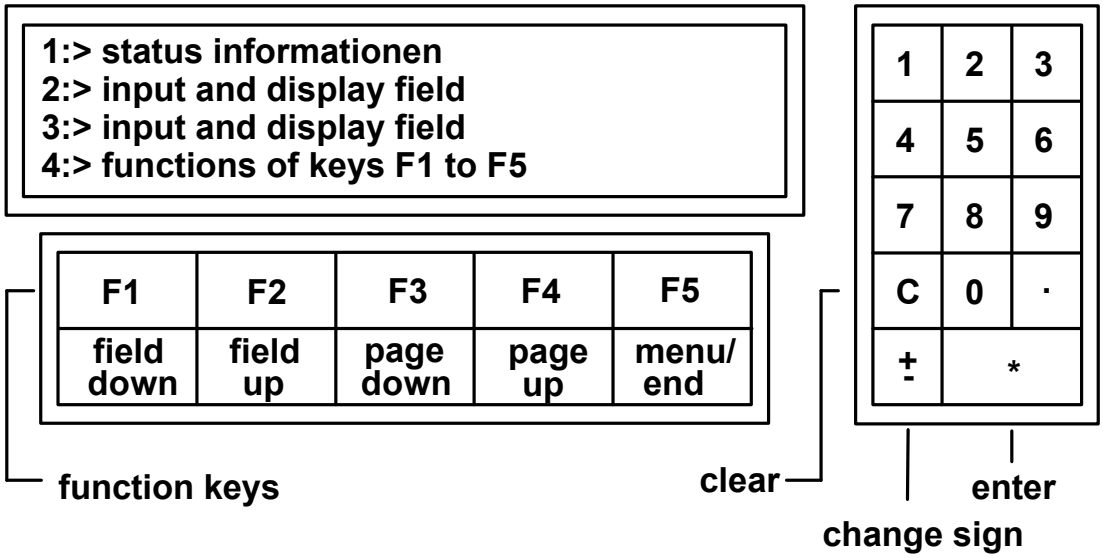
- ensures the operating mode selection
- selection by function key
- disabled operating modes are not displayed
- only possible if no operating mode and no error message are active





The respective operating mode is initiated.

3. Control elements (display and keyboard)



3.1 Display

- LCD display
- Decoded text
- Top line: status information
- Middle lines: inputs and outputs
- Bottom line: function key assignment depending on operating mode
- In some places, option menues displayed on one complete page

3.2 Keyboard

- Membrane keyboard with tactile acknowledgement (click point)
- Numeral key block for input
- Function key block for operation
- Uniform functions in all operating modes

3.3 Value input

- Inputs are immediately stored without striking another key.
- Limit monitoring
- Input routines avoid unnecessary key striking

3.4 Keyboard functions

±	Change of sign
.	Decimal point
C	Erase input field
★	Acknowledge input and jump to next input field, switch to next input mask after last field
→	Jump to next input field. Do not leave input mask. Manual mode: Driving forward by creep speed
←	Jump to previous input field. Do not leave input mask. Manual mode: Driving backward by creep speed
	Jump to next input mask. (e.g. next record, next parameter) Manual mode: Driving forward by rapid speed
	Jump to previous input mask. (e.g. previous record, previous parameter) Manual mode: Driving backward by rapid speed
	Terminate current process or operating mode. If necessary, call menue.
F1 F5	Different functions are assigned. Current assignment is displayed.

4. Program memory

- 99 programs
- 2047 records
- Variable storage partition
- Programs are generated record by record and executed.
- Each record comprises all information for a certain function.

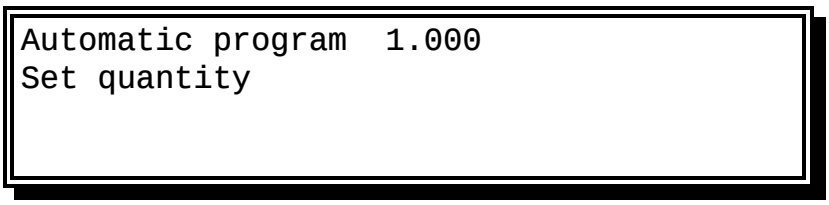
5. Operating modes

5.1 Automatic mode

5.1.1 Program number and quantity setting

If the automatic mode has been called by striking the function key "F1", the program number and the piece counter can be set:

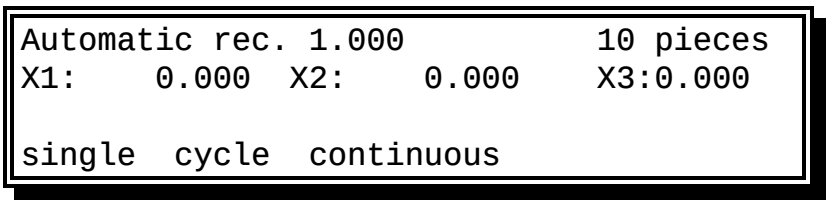
- Select program number.
- Select record number (0 = program start).
- Enter the preset quantity for the piece counter.
- Adopt the entered values by striking the key "*".

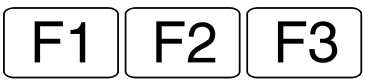


5.1.2 Releasing program for execution

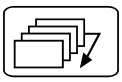
The selected program must be released for its execution. Then, the start signals are considered and the program is executed.

- Purpose: switching to ready state
- Different modes: single, cycle, continuous
- Again necessary after "STOP"
- Again necessary after terminated execution





Release program for:
F1: single step, F2: cycle run, F3:continuous run



Terminate automatic mode.

Mode	Program is executed until....
Single step	next "STOP" command next positioning command
Cycle run Continuous run	program end quantity executed
(all)	interruption after error message interruption by user

5.1.3 Initiating and interrupting program flow

After releasing the program, the program is ready for execution and waits for the start signal.

The start is released by
- a key depression stroke by the user (F1 key "-Start-")
- the connected machine, PLC or sim..

Start is always expected
- after releasing a program (sequence)
- if "STOP" is programmed at this position
- if the position requests start according to parameter 1.7 and no following block record is programmed.

A running program may be interrupted by
- a key depression strike by the user (F3 key "-Stop-")
- an interruption at input "STOP"
- an error message

5.1.4 Values displayed during program execution

The following values are displayed during program execution:

- Program and record number
- Actual position of all axles
- Piece counter (if switched on)
- Status letter (at the top on righthand side as testing aid or for checking)

Status	Controller status
S	waiting for start
W	running out of waiting time (dwell time)
E	waiting for programmed input condition
P	positioning running

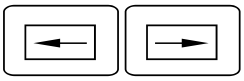
5.2 Manual mode

5.2.1 Standard functions in manual mode

- Manual movement of the drives (rapid motion, creep speed, step-by-step operation)
- Zero point setting
- Reference run
- Driving to a certain position
- Teach-In

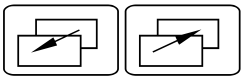
```
Manual mode axis >1<2 3
X1: 120.000   X2:  0.000     X3:   0.000

Zero. Reference Position       Teach-In
```

activate respective axle



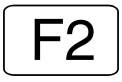
Short strike:
Step-by-Step operation (fixed step length)

Keep depressed:
Creep speed until released

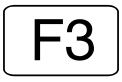


Keep depressed:
Rapid motion until released

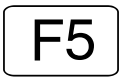
Adopt actual position as zero point



Reference run of the selected axle



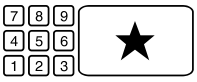
Driving to a certain position



Teach-In the actual position

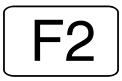
5.2.2 Driving to a certain position

```
Manual mode axis >1<2
X1:  120.000 X2:    0.000    X3:   0.000
Positioning  :    5.000 mm
absolute relative
```

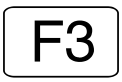


Enter position and confirm it.

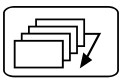
Driving to the absolute position



Driving the relative distance



Interrupt movement ("-stop-")



Terminate function

5.2.3 Teach-In

```
Teach-In
save in record    1.002
```

Enter record number and confirm it.

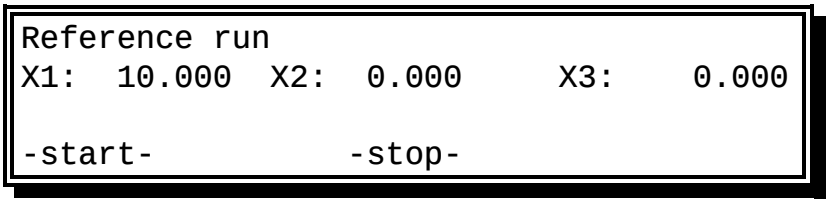
The positions are saved as absolute positions in the selected record.

5.3 Reference run

5.3.1 General information

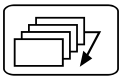
All axles approach, one after the other, the machine reference position.

- The order of the axles as well as the operational sequence are determined by parameters.



Release movement ("-start-")

Interrupt movement ("-stop-")



Terminate function

5.3.2 Calling possibilities

- Calling from manual mode
  - only the selected axle
  - start via keyboard

- Calling from automatic mode (programmed via program input)
  - all programmed axles
  - Start has already been performed in automatic mode
  - "-Start-" and -"Stop-" may be extracted

- Calling from main menue
  - All released axles
  - Start via keyboard

5.3.3 Reference shaft encoder types

- Reference cam
  - The cam is approached (search) and then left (positioning).
  - The first zero mark of the shaft encoder after leaving the cam is the reference position.
  - The cam must be at least as long as the stop distance!
  - The shaft encoder zero mark must not be too near to the cam switching point!

- Limit switch instead of reference cam
  - Connect reference input to limit switch input.
  - Observe directions!
  - Only possible for axles provided with limit switches.

5.4 Program input

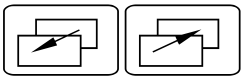
5.4.1 Program selection

- Input program and record number when calling the program input.
- The indicated program is processed.
- A program list may be displayed.

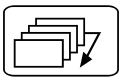
```
Which program do you want to process ?
Program number:  1.001

Program list
```

Display list of all programs.
"H" for main program.
"U" for sub-program

5.4.2 Key functions



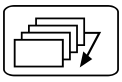
Paging through program record by record
Inputs are adopted



Leave input or menue
Call command menue
Terminate program input

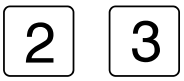
5.4.3 Processing records (command menue 1)

```
Rec.  1.001  menue >1<2 3
F1:Change record    F4:Erase record
F2:Insert record    F5:STOP/follow.rec.
F3:Remove record     *:continue input
```



Terminate program input

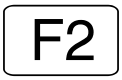
Return to program input



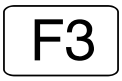
Command menue 2 or 3

Previous or next command menue

Jump to a determined record



Insert empty record Jumps/loops are corrected



Remove record (without interval) Jumps/loops are corrected

Erase content of record

Change status between
"STOP", "following-on record" and " " (neither nor)

5.4.3.1 "STOP" and "Following-on record"

"STOP" forces an intermediate stop prior to the execution of a record. The standard setting uses "STOP" to stop commands without positioning command.

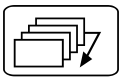
A following-record avoids such intermediate stop which would be performed, in case of standard setting, prior to each positioning command.

Following-record is used to continue the execution of commands with positioning command without start.

If neither "STOP" nor "following-record" are indicated, the controller behaves as determined by parameter 1.7 "Programm stop".
This means for standard setting, that an intermediate stop is performed prior to each positioning command and each other command is executed without start.

5.4.4 Program processing (command menue 2)

```
Rec.  1.001  menue 1>2< 3
F1:Program start    F4:Erase program
F2:Program end      F5:Program list
F3:Input prg. name  *: continue input
```



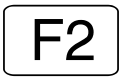
Terminate program input

Return to program input

Command menue 1 or 3

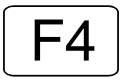
Previous or next command menue

Display first program record

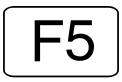


Display last program record

Input program name



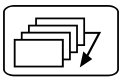
Erase program (after safety interrogation)



Display program list

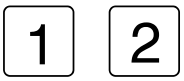
5.4.5 General processing (command menue 3)

```
Rec.  1.001  menue 1 2>3<
F1:Displace record  F4:Erase memory
F2:Copy record
F3:Copy program     * :continue input
```



Terminate program input

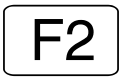
Return to program input



Command menue 1 or 2

Previous or next command menue

Displace record



Copy current record to another record
Desired record number can be entered

Copy current program to another program
Desired program number can be entered

Erase memory (all programs)
(after safety interrogation)

5.5 Parameter input

5.5.1 Password request, general password

The parameter input is password protected. Different parameter groups are available and a different password is assigned to each of them.

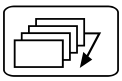
- Enter valid password.
- The password input is masked, stars are displayed.
- Terminate input by striking the "*" key.
- Each password is provided with different access authorizations.
- The general password is provided with all access authorizations incl. the distribution of the other passwords.

```
Please enter your password: ****
```

5.5.2 Parameter menue

```
Parameter input
F1:Controller data  F4:Reference run
F2:Machine data     F5:Passwords
F3:Speeds
```

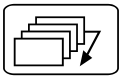
Display and enter the respective parameter group if the access authorization is available.



Terminate parameter input

5.5.3 Key functions

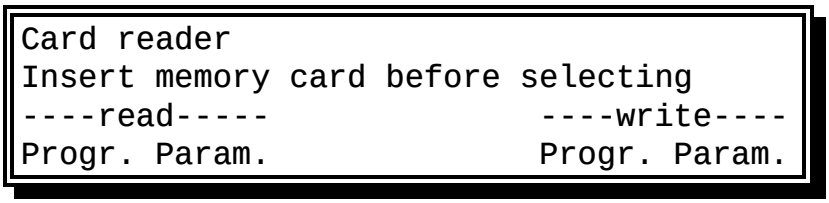
Paging through parameter list inputs are adopted



Return to menue, terminate parameter input

5.6 Card reader

- External program storage and loading.
- External parameter storage and loading.



F1 — Read programs from card
existing programs are erased

F2 — Read parameters from card
existing parameters are erased

F4 — Store program on card (all programs)

F5 — Store parameters on card

6. Programming

6.1 Record type selection

- Record contains data: the respective input screen is displayed.
- Record is empty: the record type can be selected from several menues.

The main menue is evident as example. The indicated function key serves to select the respective record type (or the respective sub-menue).

```
Rec.  1.001  --empty--
F1:Positioning     F4:Control functions
F2:M functions     F5:Inputs
F3:Reference/zero
```

F1	Positioning	F1: Relative positioning F2: Absolute positioning
F2	M functions	Machine functions (outputs)
F3	Reference/zero	F1: Reference run F2: Axles 0-Set
F4	Control functions	F1: Jump F2: Loop F3: Program call F4: Dwell time
F5	Inputs (Conditions)	F1: Jump with condition F2: Program call with condition F3: Wait for condition

6.2 Positioning commands

6.2.1 Record type "Positioning"

```
Rec.  1.001  Relative/Absolute
X1:-----.---  X2:-----.---  X3:-----.---

  Speed
```

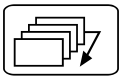
X1,X2,X3	Position to be approached using relative or incremental dimension

F1 Changing to input speed and acceleration

6.2.2 Record type "Position / Speed-display"

```
Rec  1.001  Relative/Absolute
V1:  0 %    V2:   0 %
A1:  0 %    A2:   0 %
```

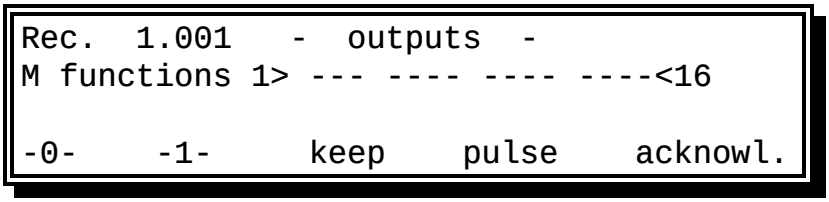
V1,V2,V3	Positioning speed in % of maximum speed (parameter)
A1,A2,A3	Positioning acceleration of maximum acceleration (parameter)



Terminate speed and acceleration-input and return to positioning input.

6.3 Record type "Machine function"

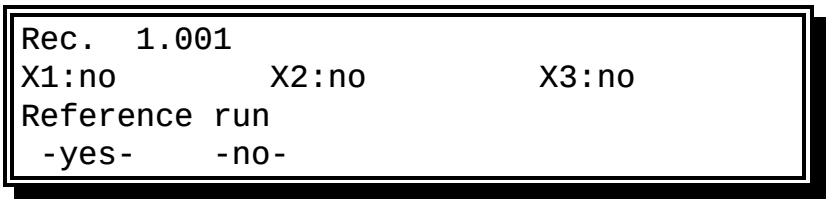
If a machine function is programmed in the displayed record or the option "M function" has been selected in the menue, the following screen is displayed:



F1	0	Connect output to 0V
F2	1	Connect output to +24V
F3	keep (-)	Do not change output
F4	pulse (p)	+24V pulse on the selected output (Pulse duration parameter 1.14)
F5	acknowledge (Q)	Connect output to +24V until the corresponding input acknowleges the function
← →	Move cursor	
★	Confirm the entered data	

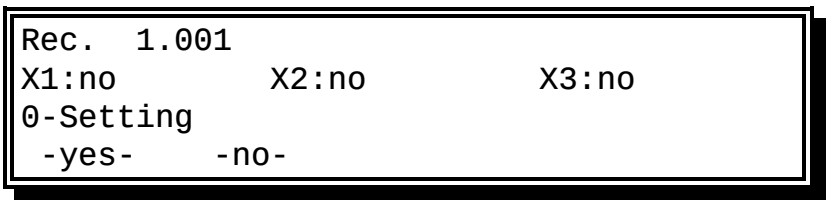
6.4 Reference run and setting 0

6.4.1 Record type "Reference run"



F1	(" -yes-")	The indicated axle performs a reference run.
F2	(" -no- ")	The indicated axle does not perform a reference run.

6.4.2 Record type "Setting axles 0"



F1	(" -yes-")	The new zero point of the indicated axle is set.
F2	(" -no- ")	No zero point is set of the indicated axle.

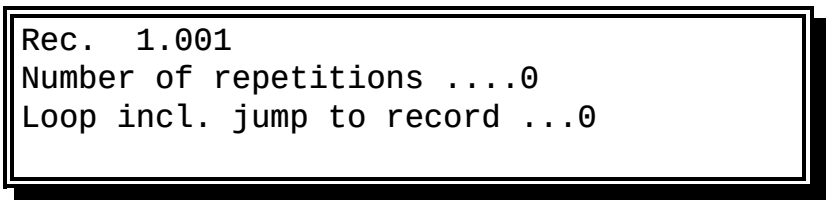
6.5 Control commands

6.5.1 Record type "Jump"

The program flow is controlled by a jump to another record of the same program.

The number of the record to be executed immediately after the jump is entered.

6.5.2 Record typ "Loop"

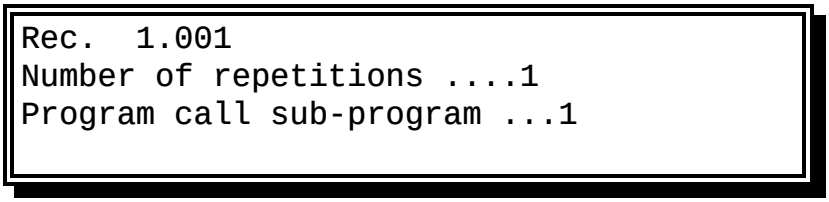


The program flow is controlled by performing a loop. The jump command is performed until the entered number of repetitions has been reached.

The number of repetitions and the number of the record to be jumped to as long as the number of repetitions has not yet been reached are entered.

A loop may comprise further loops. A maximum of 4 loops may be nested.

6.5.3 Record type "Programm call"

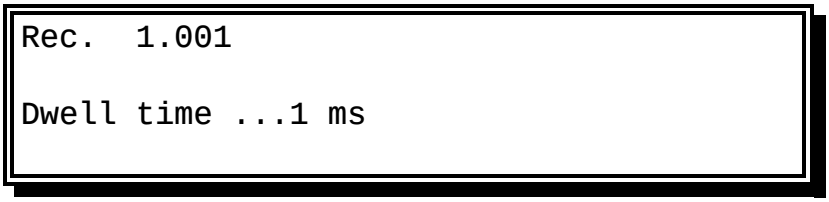


The program flow is controlled by the execution of a sub-program. The program jumps to the indicated sub-program, executes it and returns to the starting position.

The sub-program number and the number of repetitions of that sub-program are entered.

A sub-program may comprise further sub-programs calls. A maximum of 4 program calls may be nested.

6.5.4 Record type "Dwell time"



Program execution is stopped for the entered time.

The waiting time is entered in milliseconds.

6.6 Record type "Input"

The jumps and program calls may be connected to a condition at the digital inputs E1 to E16. The command is executed if the condition is fulfilled; otherwise, the program is continued by the following record.

Furthermore, it is possible to wait for a condition.

```
Rec.  1.001     -  inputs  -
Condition   1>---- ---- ---- ----<16
Jump to record no.  ...1
  -0-    -1-   don´t care
```

```
Rec.  1.001     -  inputs  -
Condition   1>---- ---- ---- ----<16
Repetit.: ...1  program call: ...1
  -0-    -1-   don´t care
```

```
Rec.  1.001     -  inputs  -
Condition   1>---- ---- ---- ----<16
Waiting for condition
  -0-    -1-   don´t care
```

F1	-0-	0V must be available at the input
F2	-1-	+24V must be available at input
F3	don´t care	Input is not considered
← →	Move input cursor	
★	Confirm the entered data	

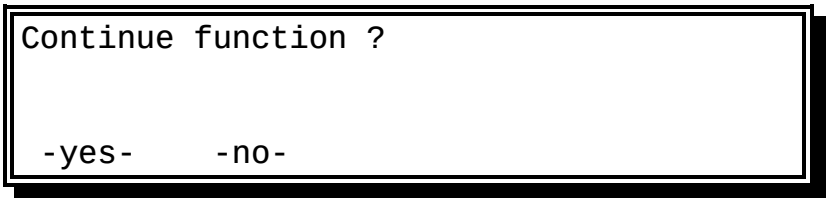
7. Error management

- All errors are displayed as decoded text.
- All axles are stopped.
- The triggering axle is stopped after E5.
- All axles are stopped after E12,E13.
- The errors must be acknowledged.
- More than 4 errors: acknowledge several times.

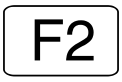
Acknowledge error messages.
Display further errors.

7.1 Possibilities to continue function after errors

- Interrogation whether the function must be continued.
- No interrogation if it is not possible to continue function.



The function interrupted by the error is continued.



Return to main menue.

7.2 External error acknowledgment

If the input "release" is interrupted and, then, connected to +24V, all error messages are acknowledged and the interrupted function continued.

8. Error messages

E0:CPS300 internal error #
E1:X# Limit switch '+'
E2:X# Limit switch '-'
E3:X# Travel limitation '+'
E4:X# Travel limitation '-'
E5:X# Positioning contouring error
E6:X# Timeout positioning

E7: free
E8: free
E9: free

E10:Incorrect start signal
E11:Stop input open
E12:Power amplifier malfunction
E13:Release input open
E14:Axle(s) not ready
E15:Reference run disabled
E16:First perform reference run

E17:First correct parameters
E18:Parameter error - speeds
E19:Parameter error - reference run
E20:Parameter error - machine data
E21:Parameter error - controller data
E22:Parameter error - incorrect checksum
E23:Program is no main program

E24:Invalid program data
E25:Invalid speed
E26:Excessive program nesting
E27:Memory filled to capacity
E28:No card reader connected
E29:Memory card - write error
E30:Incorrect memory card
E31: free
E32:Invalid speed - interpolation

8.1 Causes

Error	Possible causes
E0	(internal error)
E1, E2	run on limit switch limit switch input interruption cable break
E3, E4	run on travel limitation incorrect parameter setting e.g. incorrect calculation due to incorrect reference position
E5	Excessive deviation set-actual mechanical malfunction (e.g. drive stuck) incorrect parameter setting excessive speed, acceleration too low countouring error too low circuit amplification wrong control direction incorrect connexion or setting of drive
E6	positioning window not reached incorrect parameter setting too small positioning window too low circuit amplification mechanical malfunction (e.g. drive stuck) incorrect connexion or setting drive
E10	"Start" interrupt during positioning cable break
E11	"Stop" interrupted cable break
E12	"motor monitoring" interrupted check servo amplifier and motor cable break
E13	"release" interrupted cable break
E14	(internal error)
E15	reference run disabled but programmed
E16	incorrect parameter "reference prior to automatic" no reference run since starting up
E17	error message E18-E21 not rectified
E18-E21	incorrect setting of the parameter of the respective group
E22	incorrect leaving of parameter input interrupted after error controller switched off during parameter input

E23	sub-program or empty program initiated incorrect setting of parameter 1.15 (number of programs)
E24	incorrect program loaded by card reader
E25	speed programmed 0 incorrect parameter setting too low maximum speed speed or acceleration 0 speed exceeds maximum speed
E26	nesting of more than 4 loops incorrect loop arrangement nesting of more than 4 program calls recursion (A calls B, B calls A)
E27	excessive number or programmed records important intervals in program (to be determined with function)
E28	no card reader connected defective card reader defective interface cable defective interface
E29	electrical malfunction during write process defective memory card
E30	no memory card inserted write: memory card not sufficient for the data read: faulty data detected
E32	One of the interpolated axles exceeds the maximum speed

The control checks control-internal and operating conditions at the system side. But uncontrolled movements caused by defective components cannot be avoided in any case.

Therefore, personal danger has to be avoided at the system side by interrupting the operating voltage via the "EMERGENCY - STOP" chain.

9. Parameter data

9.1 Parameter group "Controller data"

No.	Description	Pre-set	Your setting
P1.1	Number of axles Range: 1-3	2	
P1.2	Reverse control system polarity no: control system not reversed yes: control system reversed	X1: no X2: no X3: no	
P1.3	Reverse direction of drive axles no: direction of the axis not reversed yes: direction of the axis reversed	X1: no X2: no X3: no	
P1.4	free		
P1.5	Inhibit operating mode: manual mode: no / yes program input: no / yes card reader: no / yes reference run: no / yes	 no no no no	
P1.6	Inhibit automatic mode: auto-single: no / yes auto-cycle: no / yes auto-continuous: no / yes	 no no no	
P1.7	Program stop (wait for start): 0: no stop 1: stop after each end of program 2: stop prior to each positioning	2	
P1.8	Start signal monitoring: 0: pulse start 1: monitoring / error message 2: monitoring - no residual distance run 3: monitoring - with residual dist. run	0	
P1.9	Piece counter: 0: switched off 1: continuous counting 2: counting down until 0 is reached	2	
P1.10	Start and stop via keyboard: no / yes	yes	
P1.11	Display contouring errors: no / yes	no	
P1.12	free		
P1.13	free		
P1.14	Pulse duration status outputs 0: issue signals as permanent signals 1 to 9999: pulse duration of the signals in [ms]	0	
P1.15	Main programs up to no.: Range: 1-99	99	
P1.16	Decimal places actual position: Range: 0-3	3	

P1.17	Language / Sprache D = 0 GB = 1	0	

9.2 Parameter group "Machine data"

No.	Description	Pre-set	Your setting
P2.1	Tool correction offset [mm] : Range: -9999.999 - +9999.999	X1: 0.0 X2: 0.0 X3: 0.0	
P2.2	free		
P2.3	Fastest possible acceleration at maximum speed [ms] Range: 0 - 9999	X1: 200 X2: 200 X3: 200	
P2.4	Ramp: 0: linear 1: sinus 2: polynom	X1: 1 X2: 1 X3: 1	
P2.5	Circuit amplification [(m/min)/mm] : Range: 0.01 - 9.99	X1: 1.00 X2: 1.00 X3: 1.00	
P2.6	Resolution [increments/mm]: Range: 0.001 - 9999.999	X1: 100.000 X2: 100.000 X3: 100.000	
P2.6a	Transmitter number [Incr./mot.rot.]: Range: 1 - 99999	X1: 1024 X2: 1024 X3: 1024	
P2.6b	Nominal motor speed [1/min]: Range: 1 - 9999	X1: 3000 X2: 3000 X3: 3000	
P2.7	Positioning window +/- [mm]: Range: 0.001 - 9999.999	X1: 0.050 X2: 0.050 X3: 0.050	
P2.8	Acceptable contouring error [mm]: Range: 0.001 - 9999.999	X1: 20.000 X2: 20.000 X3: 20.000	
P2.9	free		
P2.10	free		
P2.11	Cancel travel limitation: no: travel limitation active yes: travel limitation cancelled	X1: yes X2: yes X3: yes	
P2.12	Travel limitation ´+´ [mm]: Range: -9999.999 - +9999.999	X1: 0.000 X2: 0.000 X3: 0.000	
P2.13	Travel limitation ´-´ [mm]: Range: -9999.999 - +9999.999	X1:0.000 X2:0.000 X3:0.000	

9.3 Parameter group "Speeds"

No.	Description	Pre-set	Your setting
P3.1	Automatic speed override [%]: Range: 1 - 100 percent (100 % means no reduction)	X1: 100 X2: 100 X3: 100	
P3.2	Jog mode rapid motion: Range: 1 - 100 percent	X1: 20 X2: 20 X3: 20	
P3.3	Jog mode creep speed: Range: 1 - 100 percent	X1: 10 X2: 10 X3: 10	
P3.4	Jog mode acceleration: Range: 1 - 100 percent of P2.3 maximum acceler.	X1: 50 X2: 50 X3: 50	
P3.5	Jog mode increments step-by-step [increments]: Range: 1 - 9999	X1: 10 X2: 10 X3: 10	
P3.6	Reference run serach speed: Range: 1 - 100 percent	X1: 20 X2: 20 X3: 20	
P3.7	Reference run positioning speed: Range: 1 - 100 percent	X1: 10 X2: 10 X3: 10	
P3.8	Reference run acceleration: Range: 1 - 100 percent of P2.3 maximum acceler.	X1: 50 X2: 50 X3: 50	

9.4 Parameter group "Reference run"

No.	Description	Pre-set	Your setting
P4.1	Reference run order: Range: 0 - P1.1 (number of axles)	1 2 3	
P4.2	Reference position offset [mm]: Range: -9999.999 - +9999.999	X1: 0.000 X2: 0.000 X3: 0.000	
P4.3	Reference run searching forward: no: backward, i.e. direction ´-´ yes: forward, i.e. direction ´+´	X1: no X2: no X3: no	
P4.4	Reference run positioning forward: no: backward, i.e. direction ´-´ yes: forward, i.e. direction ´+´	X1: yes X2: yes X3: yes	
P4.6	Reference run to encoder zero pulse: no: no encoder zero pulse is evaluated yes: encoder zero pulse is evaluated	X1: yes X2: yes X3: yes	
P4.7	Reference run prior to automatic: no: no reference run is required before exec. automat. yes: reference run is required before exec. automatic	X1: yes X2: yes X3: yes	
P4.8	Reference switch high-active: no: connexion type is normally closed yes: connexion type is normally open	X1: yes X2: yes X3: yes	

9.5 Parameter group "Passwords"

No.	Description	Pre-set	Your setting
P5.1 P5.2 P5.3 P5.4	Password level 3: Password level 2: Password level 1: Password level 0: 0: no access Range: 1- 9999:		

9.6 Parameters with access via level 0

3.1 Automatic speed override
3.2 Jog mode rapid motion (speed)
3.3 Jog mode creep speed (speed)
3.4 Jog mode acceleration
3.5 Jog mode increments step-by-step

9.7 Parameters with access via level 1

1.16 Decimal places actual position
1.17 Language / Sprache
2.1 Tool correction
4.2 Reference position offset [mm]

9.8 Parameters with access via level 2

1.5 Inhibit operating modes
1.6 Inhibit automatic mode
1.9 Piece counter
1.15 Main programs up to no..
2.12 Travel limitation '+'
2.13 Travel limitation '-'
3.6 Reference run "Search" (speed)
3.7 Reference run "Positioning" (speed)
3.8 Reference run acceleration

9.9 Parameters with access via level 3

1.1 Number of axles
1.2 Reverse system control direction
1.3 Reverse system direction of rotation
1.7 Program stop (wait for start)
1.8 Start signal monitoring
1.10 Start and stop via keyboard
1.11 Display contouring error
1.14 Pulse duration status outputs
2.3 Fastest possible acceleration
2.4 Ramp (linear, sinus)
2.5 Circuit amplification KVP
2.6 Resolution
2.6a Transmitter number
2.6b Nominal motor speed
2.7 Positioning window
2.8 Acceptable contouring error
2.11 Cancel travel limitation
4.1 Reference run order
4.3 Reference run "searching" forward
4.4 Reference run "positioning" forward
4.5 Reference run zero pulse encoder
4.7 Reference run prior to automatic
4.8 Reference switch high-active

9.10 Example of calculation

Example data:

Shaft encoder 1250 increments
Spindle with a pitch of 10 mm
Nominal motor speed 3000 r.p.m.

2.6 Resolution / Transmitter number / nominal motor speed

Due to the integrated pulse quadruplication, 1250*4 = 5000 shaft encoder increments per motor revolution are counted. 5000 increments (1 spindle revolution) correspond to 10mm of length.

P2.6 = 5000 incr./ 10 = 500.000 incr./mm
P2.6a = 1250
P2.6b = 3000.

2.7 Positioning window

The positioning window must be big enough so that the drive is able to control with its resolution within the positioning window. The minimum value is 2 increments; using the resolution, the minimum value can be calculated in mm.

The positioning window has no influence on the control accuracy. The position control circuit works always accurately to the increment. The positioning window determines the range where the target position is reached and the signal "in position" is issued.

10. Inputs and Outputs

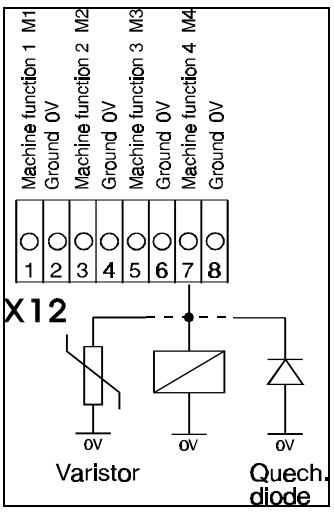
10.1 Digital inputs

Limit switch	Normally closed Limitation of acceptable travel
Reference switch	Normally closed or open (depending on parameter) Definition of reference position
Stop	Normally closed (+24V) External program interruption in automatic mode
Release	Normally closed (+24V) External release/disabling of controller External error acknowledgement (positive edge)
Automatic/manual	Normally open External start of automatic mode continuous run
Motor monitoring	Normally closed (+24V) Drive error detection
E1 to E16	Programmable inputs

10.2 Digital outputs

Ready	Static signal No error occured All axles released
Automatic ready	Static signal Automatic mode ready for startup
Program end	Static signal or pulse Program end reached Program not yet started again
Running program	Static signal Program is running
Record end	Static signal or pulse Record execution terminated
Quantity end	Static signal or pulse Quantity 0 reached after program end
In Position	Static signal or pulse Programmed position reached
Positioning	Static signal Positioning is running
Teach-In	Static signal Manual mode is active
M1-M9	Programmable machine functions

10.2.1 Connection digital outputs (e.g. Machine functions)



10.3 Technical data inputs and outputs

Digital inputs 24V:

32 digital inputs 24V

electrically decoupled
Input resistance Ri = 10-20kohm
Voltage threshold high level > = 12 volt
Voltage threshold low level < = 3 volt

Incremental shaft encoder connexions:

One incremental shaft encoder connexion per axle
Input signal levels according to RS422

- Zero pulse (UA0)
- Inverted zero pulse (/UA0)
- Channel A (UA1)
- Channel A inverted (/UA1)
- Channel B (UA2)
- Channel B inverted (/UA2)

5V supply voltage output max. 300mA

Analog inputs (option):

3 analog inputs

Input voltage 0..10V
Resolution 10 bits
Internal resistance Ri = 10 kohm

Digital outputs 24V:

16 electrically decoupled transistor outputs

+24V max. 1 A per output
8A maxi overall
Short circuit-proof
Supply 24 V d.c. voltage, external source

Release outputs:

One potential-free change-over contact per axle for "controller release" of servo
amplifier.

Contact rating at 24 V approx. 1 A

Analog outputs:

1 analog output per axle

-10V...+10V for servo amplifier
Resolution 12 bits
Internal resistance Ri = 1,2kohm
Maximum output current 5 mA

11. Technical data controller

Number of axles	1-3 axles
Input	Membrane keyboard with tactile acknowledgement
Display	Illuminated LCD display 4*40 characters
Number of programs	99 programs
Number of records	2047 records (protected against power failure)
Gear adaptation	0.001 - 9999.999 increments / mm
Control cycle time	2 ms
Controller release	1-3 potential-free contact (change over contacts)
Position Acquisition	Incremental to 250kHz (internal 4x interpolation) SSI-Interface (option) 8 to 32-bit data word length Transsonar interface (option)
Encode supply	5 V, max. 300mA per axle
Inputs and outputs	32 digital inputs 24V 16 digital outputs 24V 3 analog inputs (option) 3 analog set value outputs -10V...+10V
Supply voltage	220 VAC, approx. 0,2A; 50 Hz 24 VDC for signal outputs
Operating temperature	0^{o} to 45^{o}C
Storage temperature	-20^{o} to 70^{o}C
Humidity	max. 90 %, non-condensing
Connector plug	Clamping plug
Dimensions h x w x d	170 x 320 x 95 mm

12. Options

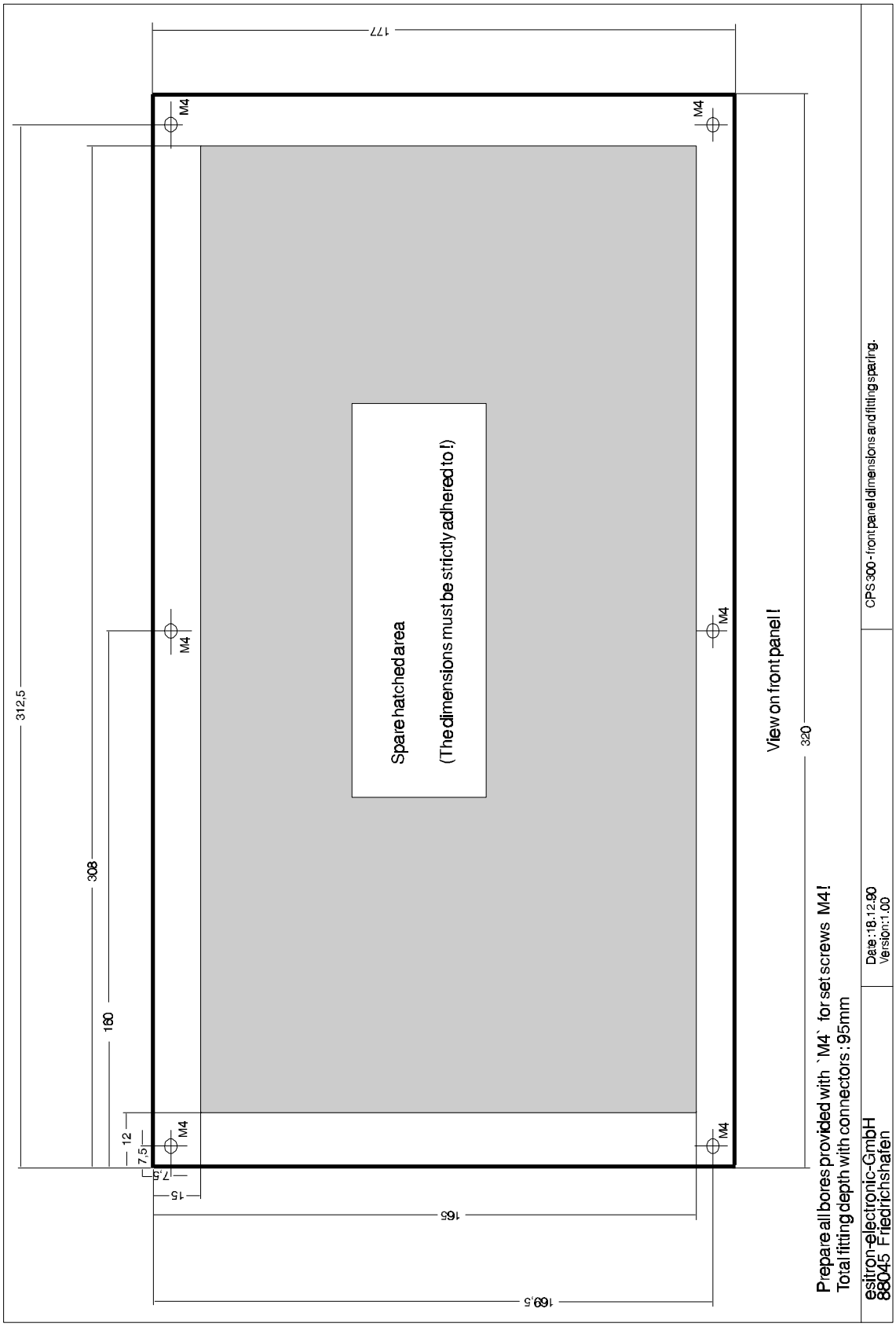
Card reader for memory card (external memory)

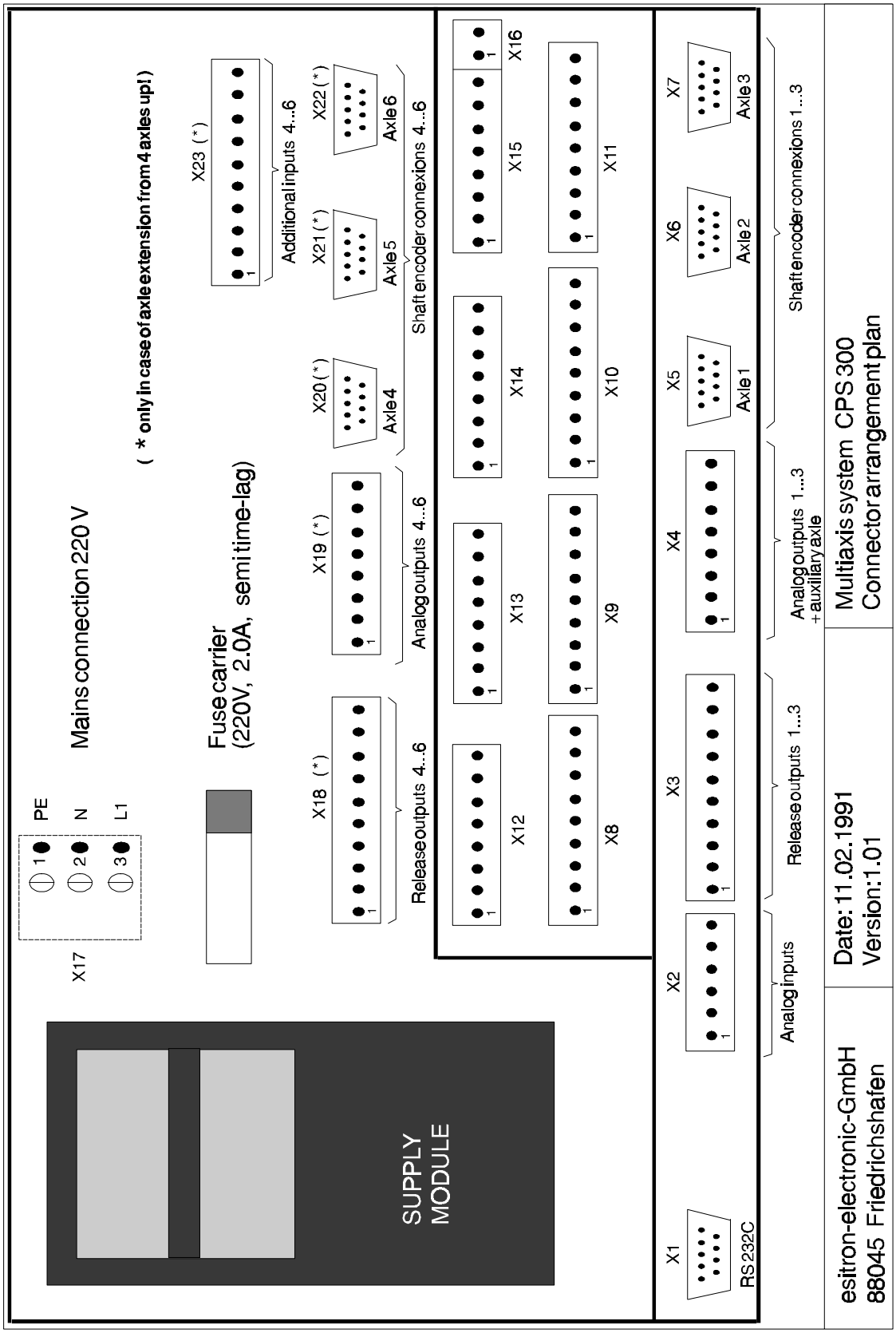
A card reader may be connected to the serial interface for the storage or transfer of programs and parameters from or to a CPS300.

13. Precautions

The control checks control-internal and operating conditions at the system side. But uncontrolled movements caused by defective components cannot be avoided in any case.

Therefore, personal danger has to be avoided at the system side by interrupting the operating voltage via the "EMERGENCY - STOP" chain.


177
M4
M4
M4
M4
M4
M4
312,5
308
160
12
7,5
7,5
15
165
169,5
Spare hatched area
(The dimensions must be strictly adhered to!)
View on front panel!
320
Prepare all bores provided with `M4` for set screws M4!
Total fitting depth with connectors: 95mm
esitron-electronic-GmbH
88045 Friedrichshafen
Date: 18.12.90
Version: 1.00
CPS300 - front panel dimensions and fitting spairing.


(* only in case of axle extension from 4 axles up!)
Mains connection 220 V
PE
N
L1
X17
Fuse carrier
(220V, 2.0A, semi time-lag)
X23 (*)
Additional inputs 4...6
X18 (*)
X19 (*)
X20 (*)
X21 (*)
X22 (*)
Axle 4
Axle 5
Axle 6
Release outputs 4...6
Analog outputs 4...6
Shaft encoder connexions 4...6
SUPPLY MODULE
X12
X13
X14
X15
X16
X8
X9
X10
X11
X1
X2
X3
X4
X5
X6
X7
RS 232C
Analog inputs
Release outputs 1...3
Analog outputs 1...3
+ auxiliary axle
Axle 1
Axle 2
Axle 3
Shaft encoder connexions 1...3
esitron-electronic-GmbH
88045 Friedrichshafen
Date: 11.02.1991
Version: 1.01
Multiaxis system CPS 300
Connector arrangement plan
171290KI

Connector no.	Pin no.	Function
X1	1	no function
(RS 232)	2	RxD (Receive Data)
	3	TxD (Transmitt Data)
	4	no function
	5	GND RS232
	6	no function
	7	no fucntion
	8	no function
	9	+5V
X2	1	Analog input 1+
	2	Analog input 1-
	3	Analog input 2+
	4	Analog input 2-
	5	Analog input 3+
	6	Analog input 3-
X3	1	Release output 1
	2	Release output 1 normally open
	3	Release output 1 normally closed
	4	Release output 2
	4	Release output 2 normally open
	6	Release output 2 normally closed
	7	Release output 3
	8	Release output 3 normally open
	9	Release output 3 normally closed
	10	no function
X4	1	Analog output axle 1+
	2	Analog output axle 1-
	3	Analog output axle 2+
	4	Analog output axle 2-
	5	Analog output axle 3+
	6	Analog output axle 3-
	7	Analog output auxiliary axle +
	8	Analog output auxiliary axle -

esitron-electronic GmbH 88045 Friedrichshafen	Pin assignment CPS300 Connectors X1,X2,X3,X4

Connector no.	Pin no.	Function
X5	1	Incremental encoder channel B
(Axle 1)	2	Incremental encoder channel B inv.
	3	Incremental encoder supply 0V
	4	Incremental encoder channel A
	5	Incremental encoder channel A inv.
	6	Incremental encoder supply 0V
	7	Incremental encoder zero pulse (Ref.)
	8	Incremental encoder zero pulse inv.
	9	Incremental encoder supply +5V
X6	1	Incremental encoder channel B
(Axle 2)	2	Incremental encoder channel B inv.
	3	Incremental encoder supply 0V
	4	Incremental encoder channel A
	5	Incremental encoder channel A inv.
	6	Incremental encoder supply 0V
	7	Incremental encoder zero pulse (Ref.)
	8	Incremental encoder zero pulse inv.
	9	Incremental encoder supply +5V
X7	1	Incremental encoder channel B
(Axle 3)	2	Incremental encoder channel B inv.
	3	Incremental encoder supply 0V
	4	Incremental encoder channel A
	5	Incremental encoder channel A inv.
	6	Incremental encoder supply 0V
	7	Incremental encoder zero pulse (Ref.)
	8	Incremental encoder zero pulse inv.
	9	Incremental encoder supply +5V
X16	1	+24V for digital outputs
	2	Ground for 24V supply
X17	1	PE / protective conductor
	2	N / neutral conductor
	3	L1 / phase
esitron-electronic GmbH 88045 Friedrichshafen		Pin assignment CPS300 Con. X5,X6,X7,X16,X17

Connector no.	Pin no.	Function
X8	1	Limit switch axle 1 +
	2	Reference switch axle 1
	3	Limit switch axle 1 -
	4	Limit switch axle 2 +
	5	Reference switch axle 2
	6	Limit switch axle 2 -
	7	Limit switch axle 3 +
	8	Reference switch axle 3
	9	Ground digital inputs
X9	1	Limit switch axle 3 -
	2	Release
	3	Automatic / manual
	4	Stop
	5	Motor monitoring
	6	not assigned
	7	not assigned
	8	Start
	9	Ground digital inputs
X10	1	Input 1
	2	Input 2
	3	Input 3
	4	Input 4
	5	Input 5
	6	Input 6
	7	Input 7
	8	Input 8
	9	Ground digital inputs
X11	1	Input 9
	2	Input 10
	3	Input 11
	4	Input 12
	5	Input 13
	6	Input 14
	7	Input 15
	8	Input 16
	9	Ground digital inputs
esitron-electronic GmbH 88045 Friedrichshafen		Pin assignment CPS300 Con. X8,X9,X10,X11

Connector no.	Pin no.	Function
X12	1	Machine function 1 M1
	2	Ground
	3	Machine function 2 M2
	4	Ground
	5	Machine function 3 M3
	6	Ground
	7	Machine function 4 M4
	8	Ground
X13	1	Machine function 5 M5
	2	Ground
	3	Machine function 6 M6
	4	Ground
	5	Machine function 7 M7
	6	Ground
	7	Machine function 8 M8
	8	Ground
X14	1	Machine function 9 M9
	2	Ground
	3	Teach-In
	4	Ground
	5	In Position / Positioning
	6	Ground
	7	Quantity end
	8	Ground
X15	1	Record end
	2	Ground
	3	Program end / Running program
	4	Ground
	5	Automatic ready
	6	Ground
	7	Ready (error message)
	8	Ground
esitron-electronic GmbH 88045 Friedrichshafen		Pin assignment CPS300 Con. X12,X13,X14,X15